OLYMPUS®

INSTRUCTIONS

IX-FLA

INVERTED REFLECTED LIGHT FLUORESCENCE OBSERVATION ATTACHMENT

This instruction manual is for the Olympus IX-FLA Inverted Reflected Light Fluorescence Observation Attachment. To obtain optimum performance and to familiarize yourself fully with the use of this attachment, we recommend that you study this manual thoroughly before operating the attachment.

AX5918

IMPORTANT

This unit employs a UIS (universal infinity system) optical design, and should be used only with UIS microscope frames, eyepieces, condensers, etc. Less than optimum performance may result if inappropriate accessories are used.

1 Getting Ready

1. This attachment is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.
2. Operating temperature and relative humidity should be in the range of 0°–40°C (32°–104°F) and 30–90%, respectively. Installation category (overvoltage category) II (in accordance with IEC664). Pollution degree II (in accordance with IEC664).
3. The high pressure mercury burner (mercury arc lamp) should be a USH102D (mfd. by Ushio Electric).
4. Make sure that the power supply unit's main switch is set to ○ (OFF). If not so, set the main switch to ○ (OFF).
5. Control that the burner is installed correctly and that all cords are correctly connected.
6. The ultraviolet rays emitted by the burner are harmful and should not be directly looked at with unprotected eyes. Be sure to use the UV protective shield with the unit. (See page 10.)
7. Do not open the lamp housing while the burner is turned on or for at least 10 minutes after it is turned off. Lamp housing parts will be extremely hot and will cause thermal injury if touched. (See page 12).
8. Do not apply excessive force to the stop mechanisms that all the functions are provided with.
9. The power supply unit contains high voltage components. Never attempt to disassemble the unit.
10. To avoid potential shock hazard, be sure to ground the power cord wire.
11. Before opening the lamp housing for replacement of the burner or other internal parts, set the main switch to ○ (OFF) and unplug the lamp housing's connecting cord plug from the output connector on the power supply unit. Wait for 10 minutes or more until the lamp housing cools down.
12. The temperature in the vicinity of the lamp housing will greatly increase. When installing the microscope, make sure to allow ample free space around and in particular above the lamp housing.
13. When installing the power supply unit (BH2-RFL-T3), ensure that there is more than 5 cm free space between its sides and surrounding walls to prevent overheating.

2 Maintenance and Storage

1. Be careful and avoid leaving dirt or fingerprints on the lenses, filters, or the high pressure mercury burner. If contaminated, clean by wiping gently with a piece of gauze. To remove fingerprints or oil stains, wipe with gauze slightly moistened with xylene or a mixture of ether (70%) and alcohol (30%).
   ★ **Since ether and alcohol are highly flammable, be careful to keep these chemicals away from open fire and potential sources of electrical sparks, such as main switches. Never attempt to use organic solvents to clean any components (especially plastic parts). To clean, use a lint-free, soft cloth lightly moistened with a diluted neutral detergent.**
2. Do not disassemble any part of the attachment.
3. The mercury burner has a service life of 200 hours. When the hour counter on the power supply unit indicates 200 hours, replace the burner with a new one. (See page 10.)
4. When not using the attachment, keep it covered with the provided dust cover and store it at a dry, clean place.
5. If a dichroic mirror cube is not going to be used for a while, place it in its container and store it in a safe place.

3 Caution

If the equipment is used in a manner not specified by this manual, the safety of the equipment may be impaired. In addition, the equipment may also be damaged. Always used the equipment as outlined in this instruction manual.

4 Safety Symbols

The following symbols are found on the microscope. Study the meaning of the symbols, and always use the microscope in the safest possible manner.

Symbol	Explanation
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual.
	Indicates that the main switch ON.
	Indicates that the main switch OFF.

CONTENTS

1 MODULE NOMENCLATURE 1 1

2 CONTROLS 2 2

3 ASSEMBLY 4 3

3–1 Module System Chart 4
3–2 Detailed Assembly Procedure 5

4 USING THE CONTROLS 12 4

5 OBSERVATION 19 5

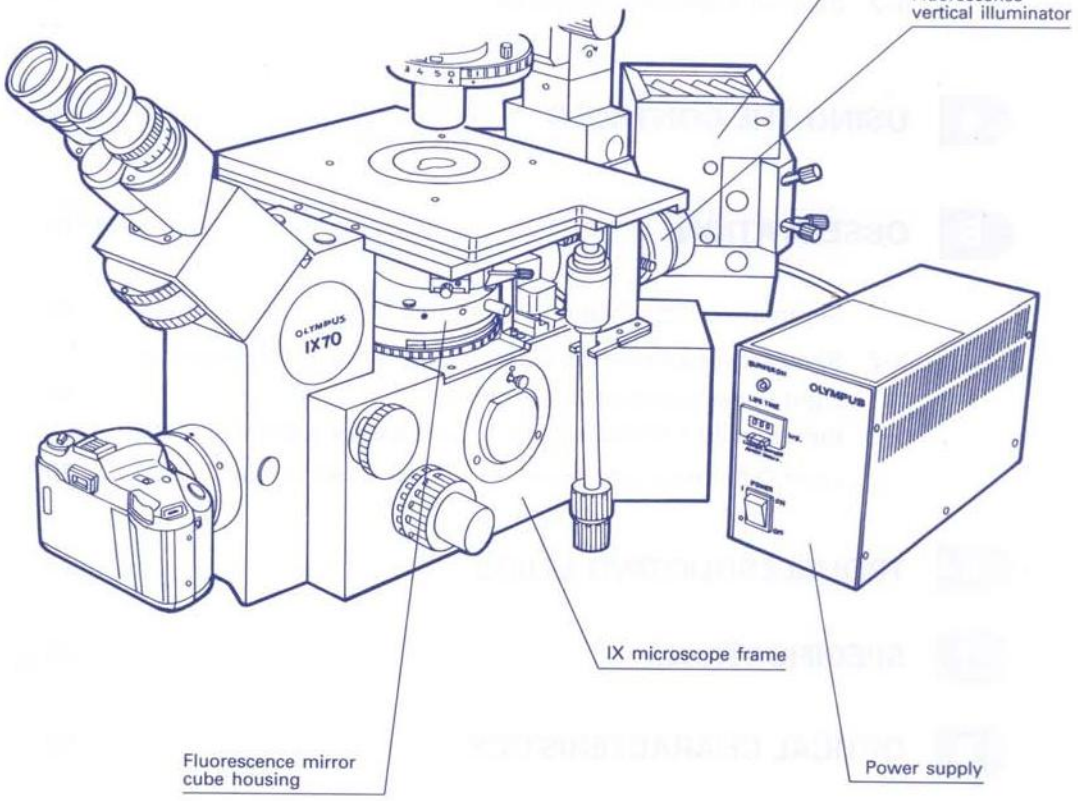
5–1 Summary of Observation Procedures 19
5–2 Simultaneous Reflected Light Fluorescence and Transmitted Light Phase Contrast Observation 20
5–3 Simultaneous Reflected Light Fluorescence and Transmitted Light Differential Interference Contrast Observation 20

6 TROUBLESHOOTING GUIDE 21 6

7 SPECIFICATIONS 22 7

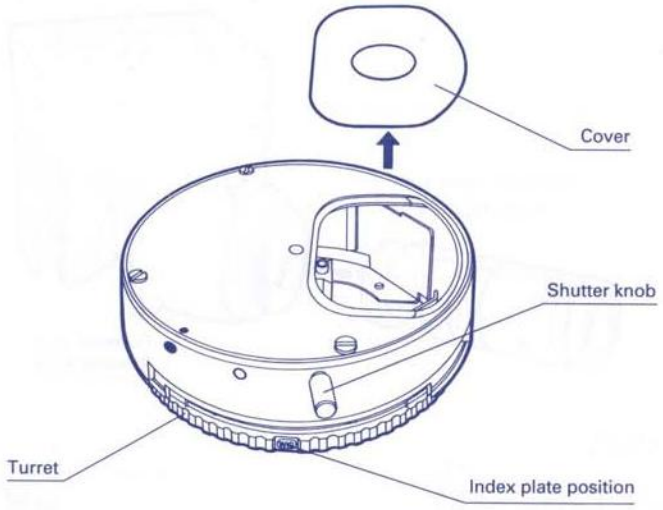
8 OPTICAL CHARACTERISTICS 23 8

1 MODULE NOMENCLATURE



2 CONTROLS

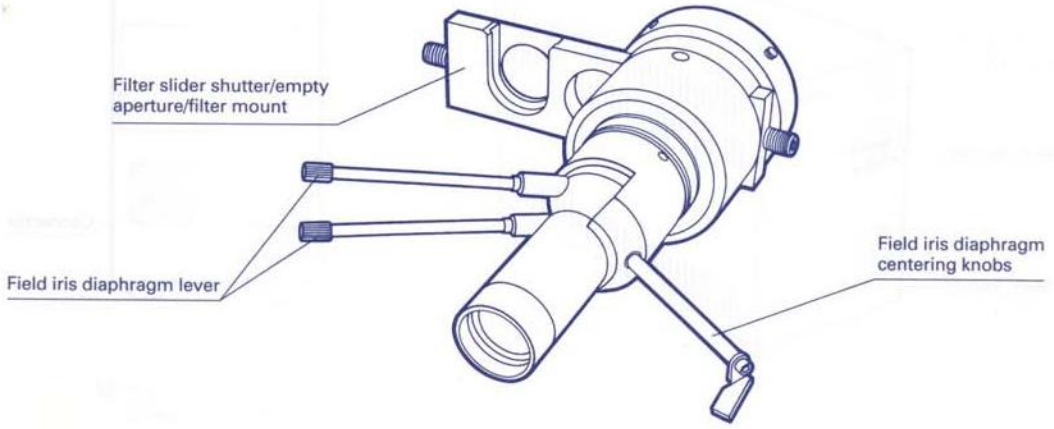
● Fluorescence Mirror Cube Housing (IX-RFAC)



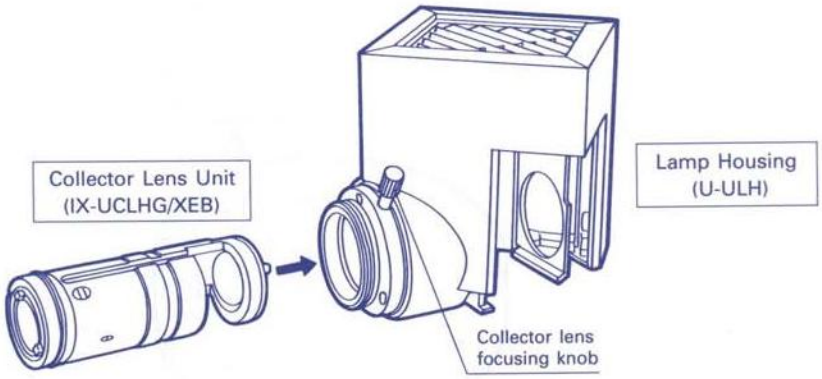
● Mirror Cube

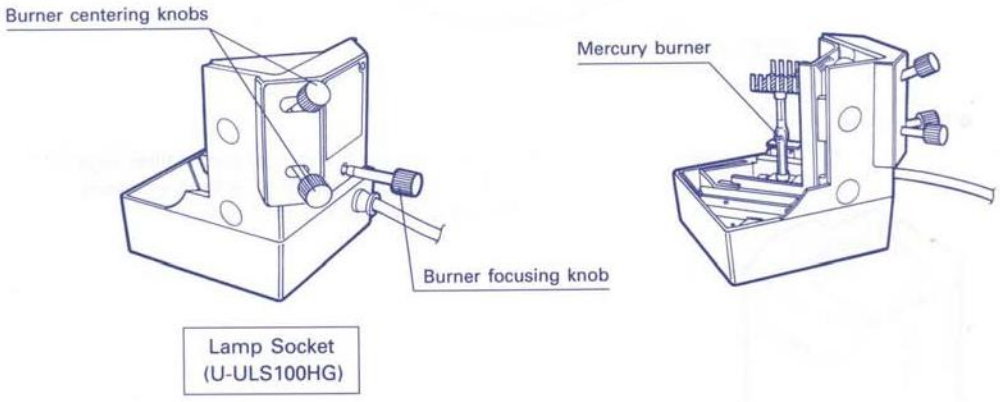
★ Consists of a combination of barrier filter, exciter filter, and dichroic mirror to suit the excitation method.
Do not disassemble the mirror cube.

● Fluorescence Vertical Illuminator (IX-RFA/S)

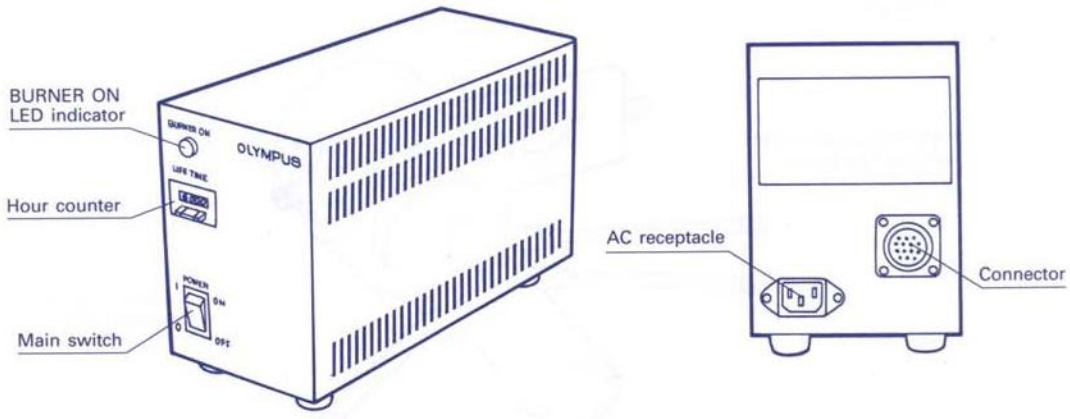


● Mercury Burner Lamp Housing





● Power Supply Unit

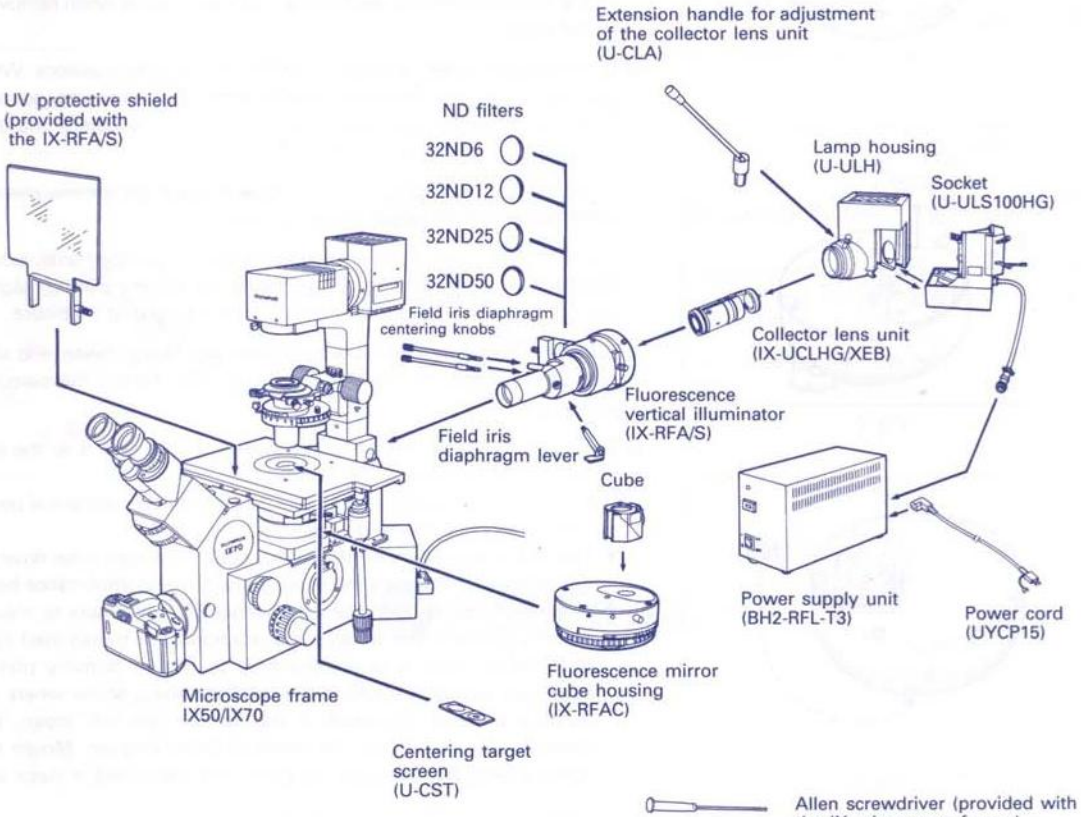


3 ASSEMBLY

3-1 Module System Chart

◎ For assembly of the IX50 or IX70 microscope, see the instruction manual provided with the microscope.

★ When assembling, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.



◎ Refer to page 17 for details on objectives compatible with different observation methods.

3-2 Detailed Assembly Procedure

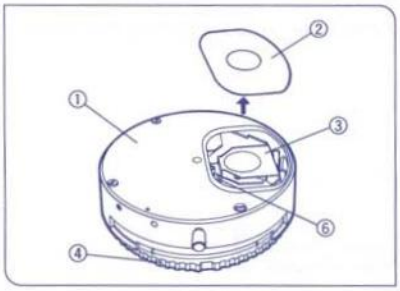


Fig. 1

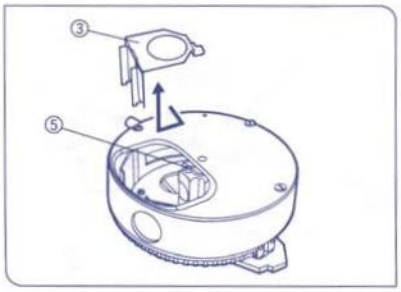


Fig. 2

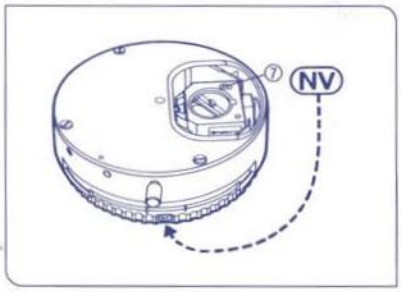


Fig. 3

1 Mounting the Cubes (Figs. 1,2,3)

◎ Refer to page 18, section 9 for details on cubes compatible with different observation methods.

1. Remove the cover ② from the mirror cube housing ①. The cover is held in place magnetically.
   ★ **After assembly, if a cube is to be replaced, make sure not to touch the dichroic mirror or exciter filter with your hands when removing the cover.**

◎ Dummy plates ③ are mounted in three of the four cube positions. When you wish to use only one cube, mount it in the remaining empty position. When using two or more cubes, remove the dummy plate(s) and then mount the actual cube(s) instead.

2. Rotate the mirror cube housing's turret ④ to place the dummy plate ③ at the position of the cube mounting hole.
3. Using the Allen screwdriver provided with the microscope frame, loosen the cube clamping screw ⑤. While sliding the dummy plate ③ slightly toward the perimeter of the turret, remove it by pulling it upward.
4. Hold the cube to be mounted with its index side facing upward and slide it all the way onto the dovetail mount ⑥. Then tighten the clamping screw ⑤.
5. Remove the cube's magnetic index sticker ⑦ and affix it to the corresponding turret index sticker position*.
   *Use a sharp object such as the tip of a ballpoint pen or mechanical pencil to lift the magnetic cube index sticker.
   ★ **The alphabetic letters on the mirror cube housing's cube dovetail and those at the turret's index positions have no importance here.**
   ★ **When performing fluorescence observation, make sure to mount dummy plates in the empty cube positions. For transmitted light observation only, it is unnecessary to mount dummy plates. However, be sure to tighten the cube clamping screw where no dummy plate is mounted. If the screws are left loose, the protruding screw heads may obstruct turret rotation. Mount the dummy plate by reversing the procedure described in steps 2-4.**
6. Put back the cube housing's cover ②.

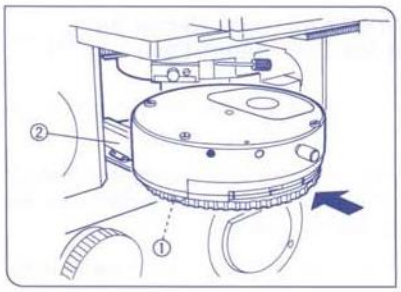


Fig. 4

2 Mounting the Fluorescence Mirror Cube Housing (IX-RFAC) (Fig. 4)

★ Before mounting or removing the mirror cube housing, always make sure that the power supply unit's main switch is set to ○ (OFF).

1. Using the Allen screwdriver, loosen the clamping screw ① of the microscope's mirror cube housing dovetail. Remove the housing dummy.
2. Positioning the mirror cube housing dovetail ② as shown in Fig. 4, insert the mirror cube housing as far as it will go into the microscope's mirror cube housing compartment.
3. Using the Allen screwdriver, firmly tighten the clamping screw ① of the microscope's mirror cube housing dovetail.

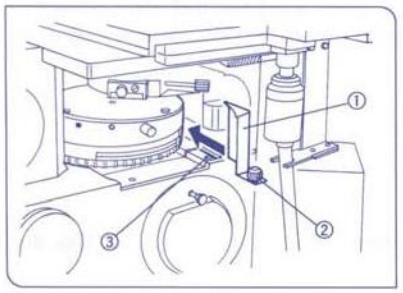


Fig. 5

3 Mounting the Light Excluding Plates (Fig. 5)

◎ Light excluding plates protect against leaking ultraviolet light and should be attached at both the left and right side, and each plate has different shape, respectively.

1. Attach one of the light excluding plates (for right side) ① provided with the mirror cube housing so that the clamping knob ② and the threaded portion ③ of the groove on the microscope frame mate together.
2. Turn the clamping knob ② and tighten firmly.
3. Attach the other light excluding plate in the same manner at the opposite side.

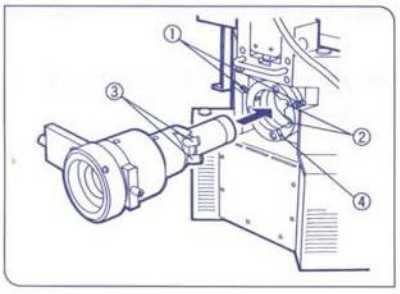


Fig. 6

4 Mounting the Fluorescence Vertical Illuminator (IX-RFA/S) (Fig. 6)

1. Using the Allen wrench provided with the fluorescence vertical illuminator, loosen the two screws ① on the fluorescence vertical illuminator mount on the rear of the microscope.
2. Insert the fluorescence vertical illuminator into the mount in such a manner that the field iris diaphragm knob seats ③ fit into the mount holes ② of the fluorescence vertical illuminator mount.
3. Further insert the fluorescence vertical illuminator until its positioning pin fits into the positioning groove ④ on the fluorescence vertical illuminator mount on the microscope.
4. Using the Allen wrench, tighten the two screws ① on the mount.

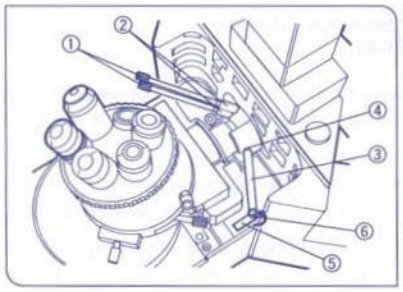


Fig. 7

5 Attaching the Field Iris Diaphragm Centering Knobs and the Field Iris Diaphragm Lever (Fig. 7)

1. If a stage is mounted to the microscope, loosen the clamping screw with the Allen wrench and remove the stage.
2. Insert the two field iris diaphragm centering knobs ① into their seats ② on the fluorescence vertical illuminator. Turn the knobs clockwise until slightly before they can be turned no further.
3. Screw the field iris diaphragm lever ③ into the threaded hole (4) in the fluorescence vertical illuminator until it stops.
4. Using the Allen screwdriver, turn the clamping screw ⑥ of the field iris diaphragm lever's operation knob ⑤ slightly counterclockwise to loosen it a little.
5. Rotate the operation knob ⑤. When a position that offers operational ease during observation is found, tighten the clamping screw ⑥ firmly.
6. Mount the stage.

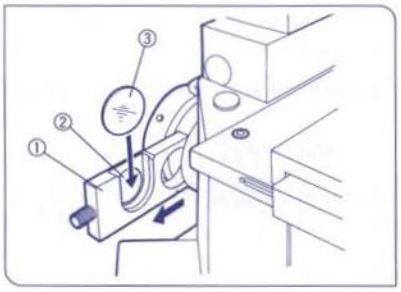


Fig. 8

6 Mounting the ND Filter (Fig. 8)

1. Slide the fluorescence vertical illuminator's filter slider ① in the direction of the arrow.
2. Insert the filter ③ into the U-shaped filter holder ②.
   ★ **Before replacing filters, make sure the filter and filter holder has cooled down.**

◎ Compatible filter sizes are: Outer diameter 32 mm; thickness max. 6 mm

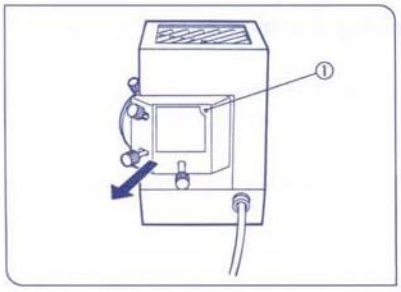


Fig. 9

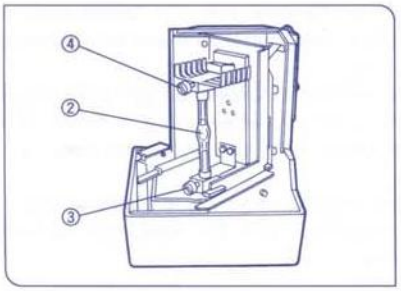


Fig. 10

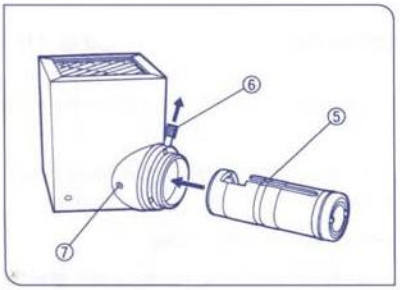


Fig. 11

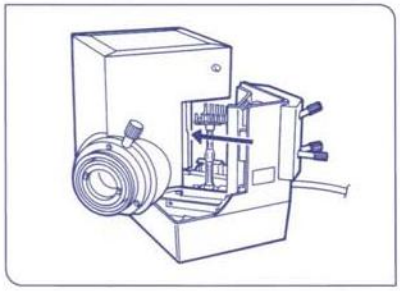


Fig. 12

7 Assembling the Lamp Housing for the Mercury Burner (Figs. 9,10,11,12)

Mounting the Mercury Burner

1. Using the Allen screwdriver, remove the burner socket clamping screw ①.
2. Detach the socket (U-ULS100HG) from the lamp housing (U-ULH) by pulling in the direction indicated by the arrow. (Fig. 9)
3. Loosen the burner clamping screws ③ and ④ (Fig. 10) and remove the securing post. (For burner replacement, remove the used burner.)
4. Loosen the + pole clamping screw ③ and the – pole clamping screw ④ (marked UP). Mount the mercury burner ② between the terminals with its + pole downward. Then tighten the clamping screws.
   - ★ **Only use a USH102D burner (mfd. by Ushio Electric).**
   - ★ **Be careful and avoid leaving fingerprints or contaminants on the mercury burner. If contaminated, clean by wiping gently with gauze slightly moistened with xylene or a mixture of ether (70%) and alcohol (30%).**
   - ★ **At this point, and in this state, mount the collector lens unit.**
   - ★ **To prevent possible damage to the burner, the collector lens unit can only be installed or removed while the socket and lamp housing are separated.**

Mounting the Collector Lens Unit (IX-UCLHG/XEB)

1. Aligning the collector lens unit positioning groove ⑤ with the pin inside the lamp housing, pull up the collector lens focusing knob ⑥, and slide the collector lens unit into the lamp housing as far as it will go. Then release and return the collector lens focusing knob ⑥ to its original position. At this point, confirm that the collector lens can be moved back and forth by turning the focusing knob ⑥. If not, adjust the position of the collector lens with a hand so that it will click into its proper position.
2. Tighten the collector lens unit clamping screw ⑦. (Fig. 11)
3. Reattach the socket to the lamp housing by reversing the procedure in "Mounting the Collector Lens Unit" above. (Fig. 12)
4. Firmly tighten the socket clamping screw ① with the Allen screwdriver. (Fig. 9)
   - ★ **If the clamping screw ① is accidentally loosened while the burner is operating, the interlock switch turns off the burner. To restart the burner, first turn OFF the main switch on the power supply. Then disconnect the connecting cord plug from the output connector on the power supply unit and wait for about 10 minutes. Then, after firmly tightening the clamping screw ①, reconnect the connecting cord plug and turn ON the main switch again.** (Fig. 9)

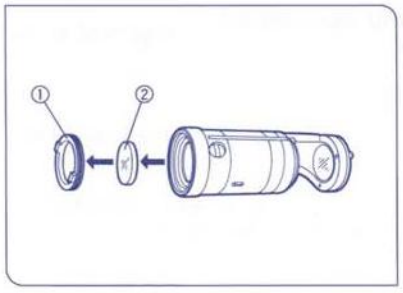


Fig. 13

8 Mounting and Removing the Heat Filter (Fig. 13)

◎ The IX collector lens unit is equipped with one built-in heat filter. Since this filter absorbs infra-red rays, it may be removed if it is desirable to raise the transmission ratio in the infra-red range.

1. Rotate and remove the heat filter clamping ring ① from the collector lens unit.
2. Remove the heat filter ②.

◎ To mount the filter, reverse the above procedure.

★ After the illumination has been turned on for while, the collector lens unit and the heat filter become very hot. Leave to cool completely before detaching the collector lens unit for mounting or removal of the heat filter.

★ When the heat filter is removed, the illumination light will contain some infra-red rays. Accordingly, when using a TV-camera sensible to the infra-red range, flare may occur and resolution may decrease.

★ When the heat filter is removed, commercially available ND filters may be scorched (if mounted) and the specimen surface temperature may increase.

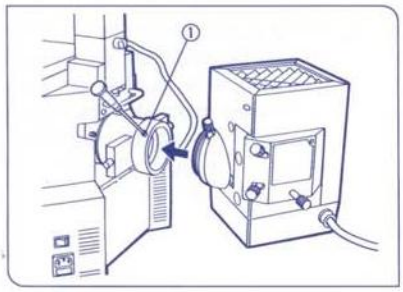


Fig. 14

9 Mounting the Lamp Housing (Fig. 14)

1. Using the Allen screwdriver, loosen the two set screws ① on the lamp housing bracket.
2. Insert the collector lens unit into the port as shown in the figure. Insert until it comes up against the bracket.
3. Tighten the two screws ① with the Allen screwdriver.

★ The temperature in the vicinity of the lamp housing will greatly increase. When installing the microscope, make sure to allow ample free space around and in particular above the lamp housing.

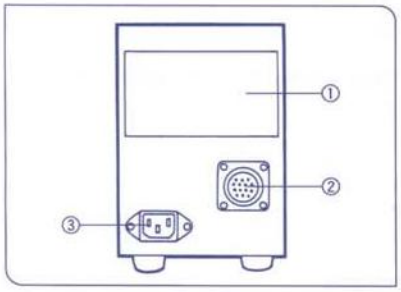


Fig. 15

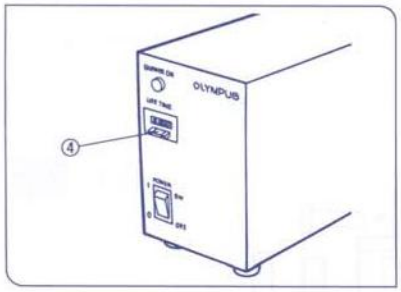


Fig. 16

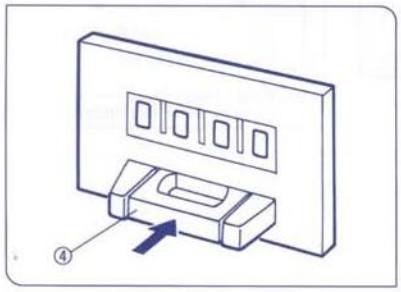


Fig. 17

10 Connecting the Power Supply Unit (BH2-RFL-T3) (Figs. 15,16,17)

1. Verify that the voltage and frequency of the AC mains outlet match the requirements indicated on the rating plate ① on the power supply unit. (100V models can be used with voltages in the 100-120V, 50-60 Hz, range. 200V models can be used with voltages in the 220-240V, 50-60 Hz, range.)
2. Plug the connecting cord plug firmly into the output connector ② on the power supply unit.
3. Connect the power cord to the AC receptacle ③ on the power supply unit. Then plug the power cord plug into a wall outlet.

Resetting the Burner Life Time Hour Counter

1. To reset the burner life time counter to "000.0", press the center portion of the reset button ④ on the power supply unit's front panel. (Figs. 16,17)

◎ The counter shows elapsed time in hours. In order not to impair the safety of the equipment, replace the burner when the counter indicates "200.0" hours.

Mercury Burner Replacement

1. In order not to impair the safety of the equipment, replace the burner when it has been used for 200 hours.
2. Before replacing the burner, wait at least 10 minutes after turning the burner off. Before removing the burner, confirm that the main switch on the power supply unit is set to ○ (OFF), and unplug the connecting cord plug from the output connector on the power supply unit. Refer to page 8 for details on replacement procedure.
3. After replacing the burner, reset the burner life time hour counter to "000.0" as outlined above.

◎ In addition to using the mercury burner as the light source for reflected light fluorescence, a 75W Xenon lamp may also be used. It is useful as a safe light source for light measurement, etc. For more details, contact your Olympus representative.

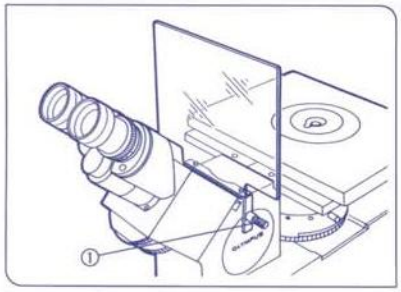


Fig. 18

11 Mounting the UV Protective Shield (Fig. 18)

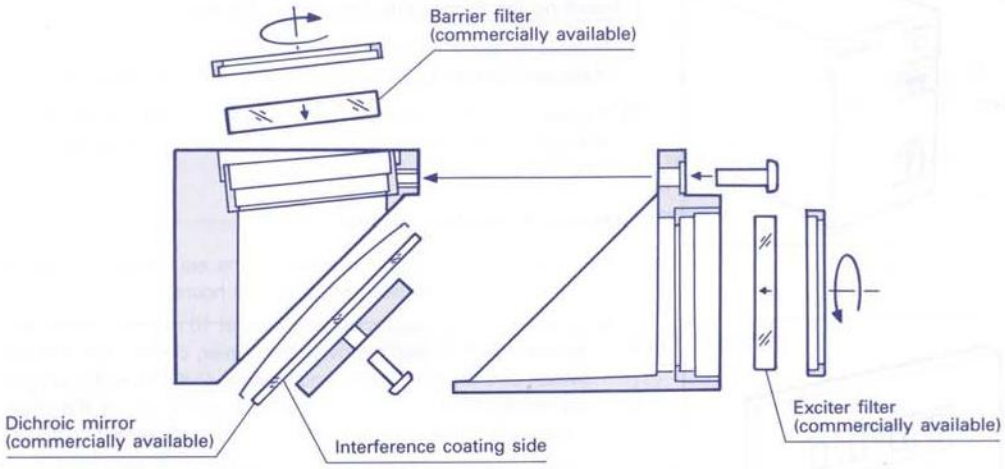
1. Rotate the clamping knob ① on the UV protective shield to loosen the knob.
2. Place the UV protective shield on the microscope frame's observation tube holder as shown in Fig. 18.
3. To hold the shield firmly in place, tighten the clamping knob.

12 Optional Cubes

◎ Optional cubes can be constructed using commercially available barrier filters, exciter filters, and dichroic mirrors.
◎ Use a free cube (U-MF) containing no optical parts for the construction.

Required Dimensions of Optical Components for Cubes

- Barrier filter, Exciter filter: 24.8 -24.9 mm diameter, max. 6 mm thickness
- Dichroic mirror: 25.7 -25.9 mm X 37.7 -37.9 mm, 0.95 -1.05 mm thickness



★ When replacing dichroic mirrors, make sure not to leave contamination in the form of fingerprints, etc.

4 USING THE CONTROLS

◎ General Precautions for Observation

1. Confirm that the power supply voltage and frequency match the requirements indicated on the rating plate.
2. Make sure that the power cord and connecting cords are firmly and correctly plugged in.
3. If it is required to perform transmitted light phase contrast or transmitted light differential interference contrast observations alone, leave one cube position on the turret empty. This allows for transmission of white light.
4. During use, the field iris diaphragm should be stopped down so that it is circumscribed by the field of view. If the diaphragm is not centered precisely, adjust the centration with the centering knobs until so.
5. Always use immersion oil with oil immersion objectives.
6. When using LCPlan FI series objectives, use these with correction plates when observing through the objective. The correction plates can compensate for material characteristics and thickness of vessels. More information on the types of available correction plates can be found in the instruction manual for the IX50/IX70 microscope.
7. Use of an objective with correction collar, such as UPlanApo40X, PlanApo40X, UAPO40X/340, UPlanApo60XW, LCPlan FL 40X, 60X, allows compensation for decreased resolution due to dispersion by the thickness of the cover glass. Correction procedure: While rotating the correction collar, focus with the fine adjustment knob until the position with the best resolution is found.
8. Use the shutter if observation is to be interrupted for a short time during the procedures. (Turning the mercury burner on and off repeatedly will significantly shorten the service life of the burner.)

1 Turning On the Power

Press the main switch on the power supply unit to I (ON). Between 5 to 10 minutes are required for the arc to stabilize after the burner is ignited.

★ **Some mercury burners may not ignite the first time the power is turned on. If the burner does not ignite, turn the main switch OFF once, then wait 5 to 10 minutes before turning it ON again.**
★ **To avoid shortening the life of the burner, do not turn the burner off within 15 minutes of ignition.**
★ **After turning the burner off, it cannot be re-ignited before the mercury vapor cools and condenses to a liquid. Wait for about 10 minutes before restarting the burner.**

◎ If the lamp house is opened while the burner is ignited, the safety interlock will activate and switch off the power automatically. In this event, press the main switch to O (OFF), then wait for 10 minutes or more before re-igniting the burner. Do not open the lamp housing before it is sufficiently cooled down.

◎ When resetting the burner life time hour counter, make sure to press the button until the counter reading is "000.0".

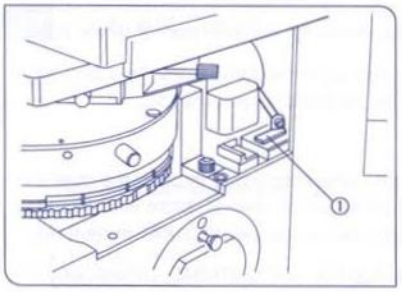


Fig. 19

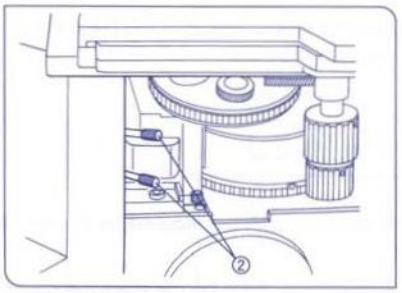


Fig. 20

2 Centering the Field Iris Diaphragm (Figs. 19, 20)

1. Rotate the revolving nosepiece to engage the 10X objective. Place the specimen on the stage and bring the image into approximate focus.
2. Turn the fluorescence vertical illuminator's field iris diaphragm lever ① counterclockwise to stop down the field iris diaphragm until the diaphragm image is inside the perimeter of the field of view. (Fig. 19)
3. While turning the field iris diaphragm lever ① clockwise to gradually open the field iris diaphragm, turn the two field iris diaphragm centering knobs ② on the fluorescence vertical illuminator to adjust so that the image of the diaphragm is centered in the field of view. (This is the state where the field iris diaphragm image is inscribed in the field of view.) (Figs. 19, 20)
4. Further enlarge the field iris diaphragm diameter until the diaphragm image just circumscribes the field of view.

3 Adjusting the Field Iris Diaphragm

◎ To prevent stray excitation light and limit specimen fading in fluorescence observation, the field iris diaphragm is used to adjust the diameter of the illuminating beam. Stopping down the field iris diaphragm may increase the contrast somewhat.

◎ When the field iris diaphragm lever is turned clockwise, the diaphragm opens. When the lever is turned counterclockwise, the diaphragm is stopped down.

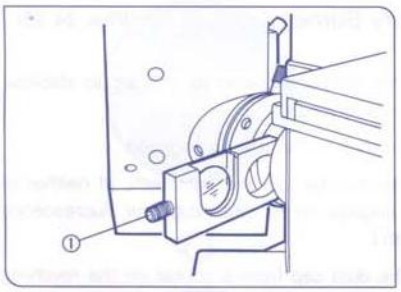


Fig. 21

4 Using the Filter Slider (Fig. 21)

◎ Hold the knob ① on the fluorescence vertical illuminator's filter slider and move the slider to the left or right to select either shutter, open aperture, or the filter holder setting. When pulled to it leftmost position, the shutter is engaged. Push the slider one step to the next click-stop to engage the empty aperture. When pushed to it rightmost position, the filter holder is engaged.
To adjust the illumination intensity, insert a suitable ND filter (32ND6, 32ND12, 32ND25, 32ND50) into the filter holder and engage the filter. To prevent specimen fading during periods of no observation, engage the shutter to block the excitation light.

★ **Note that the metal frame of the filter slider and the filter will become very hot if the filter is left inserted for a long time while the mercury burner is on. Be careful when operating the filter slider or mounting/removing an ND filter.**

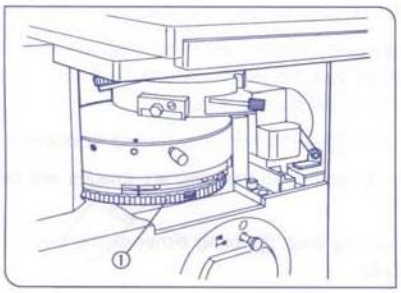


Fig. 22

5 Rotating the Turret of the Mirror Cube Housing (Fig. 22)

Rotate the turret ① until the magnetic cube index sticker of the cube to be used can be seen in the window. When the turret is stopped at the click-stop, the cube is engaged into the light path.

★ **If the turret is not at a click-stop but is stopped at an intermediate position, the cube may become deformed if the illumination is left on for a long time. Always make sure to stop the turret at a click-stop.**

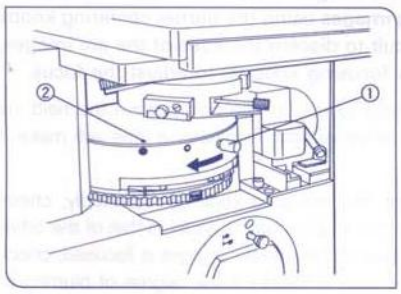


Fig. 23

6 Opening and Closing the Cube Housing Shutter (Fig. 23)

1. Move the shutter knob ① in the direction of the arrow. When the ○ symbol and the • index dot ② are aligned, the shutter is open.
2. To engage the shutter and block the excitation light, move the shutter knob ① in the opposite direction of the arrow to where the ● symbol and the • index dot ② are aligned.

★ **The shutter knob on the mirror cube housing can be used to block excitation light from reaching the specimen. However, when detaching the mirror cube housing from the IX microscope, always engaged the shutter of the fluorescence vertical illuminator's filter slider or turn off the light source before doing so.**

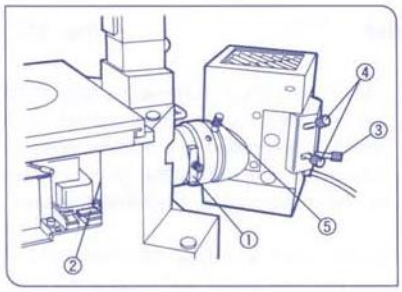
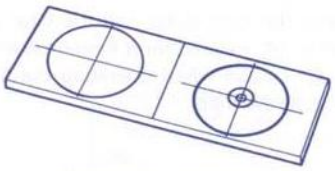


Fig. 24



Centering target screen

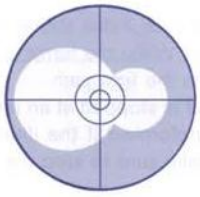


Fig. 25-A

Fig. 25-B

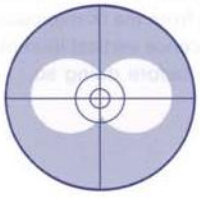


Fig. 25-C

7 Centering the Mercury Burner (Figs. 24, 25)

◎ Before attempting to center the burner, wait for the arc to stabilize. (5-10 minutes after burner is ignited.)

1. Place the filter slider ① so that the shutter is engaged.
2. Engage the B or IB excitation cube into the light path. (If neither of these cubes is available, engage some other cube for fluorescence light use into the light path.)
3. Remove an objective or the dust cap from a socket on the revolving nosepiece. Rotate the revolving nosepiece to engage this position.
4. Place the transparent side of the centering target screen (U-CST), or a white sheet of paper, at the center of the stage.
   ★ If a U excitation cube is used for this adjustment, do not look directly at the light. If it is inevitable to use the U excitation cube, be sure to detach the UV protection shield and place it on top of the centering target screen (U-CST) or the white sheet of paper.
5. Turn the field iris diaphragm lever ② to open the diaphragm. (Fig. 24)
6. To completely open the light path, position the filter slider ① so that the open aperture is engaged and set the fluorescence mirror cube housing's shutter knob so that the shutter is open.
7. Screw the burner focusing knob ③ all the way in by turning it clockwise.
8. Using the centering knobs ④, adjust so that two arc images will be visible as shown in Fig. 25-A.
9. Using the collector lens focusing knob ⑤, bring either of the two arc images into focus. (Fig. 25-B)
10. Using the burner focusing knob (3), adjust the sizes of the two arc images so that they will be almost identical. (Fig. 25-C)
    ★ At this point, the two arc images may move. In this case, adjust the position of the arc images using the burner centering knobs ④. If it becomes difficult to discern the sizes of the arc images, use the collector lens focusing knob ⑤ to adjust the focus.

◎ If the arc images are difficult to discern, stopping down the field iris diaphragm on the fluorescence vertical illuminator a little will make it easier to see the images.

11. While turning the collector lens focusing knob ⑤ repeatedly, check that the degree of blurring of one arc image is equal to that of the other arc image. (That is, when one of the two arc images is focused, check that the other arc image is also in focus.) If the degree of blurring of one arc image is different from that of the other (the focusing positions of the two arc images do not match each other), repeat the above steps 9, 10, 11.

Fig. 25-D

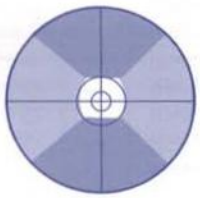


Fig. 25-E

12. After making sure that the degree of blurring of one arc image is equal to that of the other (the focusing positions of the two arc images are identical), overlay the two arc images using the burner centering knobs ④. (Fig. 25-D)
13. After the two arc images are superimposed, they appear as shown in Fig. 25-E. This completes the burner centering adjustment.

◎ In Fig. 25-E the center of the centering target screen (U-CST) and the center of the arc images are identical. However, it is not necessary to match the two centers.

14. Before observation, adjust the collector lens focusing knob ⑤ so that the illumination in the visual field will be uniform.
    - ★ **To avoid serious injury, never open the lamp housing while the burner is turned on or immediately after it is turned off.**
    - ★ **Center the burner again each time it is replaced.**

◎ If the collector lens focusing knob is too far from the observer for comfortable use, an extension handle for collector lens adjustment (U-CLA) may be employed. Extension handle is available for remote operation (desired angle is obtained by universal joint system). (Fig. 26)

1. Attach the mounting section ① by pushing it on the collector lens focusing knob of lamp housing (U-ULH).
2. Adjust the focus of collector lens by rotating the knob ②.
    - ★ **Care should be taken as there is a possibility that the universal joint ③ is broken if excessive force is applied on it.**
    - ★ **When to remove the handle from lamp housing, allow enough time after switching off the light until it is cooled down adequately. Because the metal part of mounting section ① will be heated to high temperature if the light is kept on for a long time.**

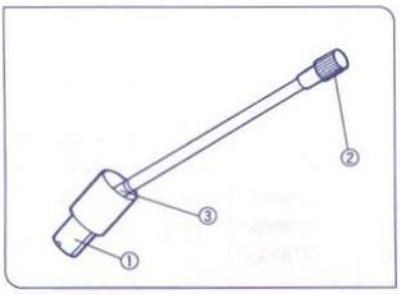


Fig. 26

8 Objectives for Various Observation Methods

Objective		Reflected fluorescence								Transmitted phase contrast	Transmitted DIC		
		340	U	V	BV	B	IB	G	IY		U-UCDB		IX-LWUCD
											TLO	TLD	
UPlanApo	4X	△	○	○	○	○	○	○	○	—	—	—	—
	10X	△	○	○	○	○	○	○	○	○*(Ph1)	—	○	○
	20X	△	○	○	○	○	○	○	○	○*(Ph2)	—	○	—
	40X	△	○	○	○	○	○	○	○	—	—	○	○
	40X OI	△	○	○	○	○	○	○	○	○*(Ph3)	○	○	—
	100X OI	△	○	○	○	○	○	○	○	○*(Ph3)	○	○	○
UPlanFl	4X	△	○	○	○	○	○	○	○	○*(PhL)	—	—	—
	10X	△	○	○	○	○	○	○	○	○*(Ph1)	—	○	○
	20X	△	○	○	○	○	○	○	○	○*(Ph1)	—	○	—
	40X	△	○	○	○	○	○	○	○	○*(Ph2)	—	○	—
	100X O	△	○	○	○	○	○	○	○	○*(Ph3)	○	○	○
	100X OI	△	○	○	○	○	○	○	○	—	○	○	○
CPlanFl	10X Ph	△	△	△	△	△	△	△	△	○*(PhC)	—	—	○
UApo	20X/340	○	○	○	○	○	○	○	○	—	—	—	—
	40X/340	○	○	○	○	○	○	○	○	—	—	○	○
	40X OI/340	○	○	○	○	○	○	○	○	—	○	○	—
UPlanApo	60X W	△	○	○	○	○	○	○	○	—	○	○	○
LCPlanFl	20X	—	—	—	—	○	○	○	○	○*(Ph1)	—	○	○
	40X	—	△	△	△	○	○	○	○	○*(Ph2)	—	○	○
	60X	—	—	—	—	○	○	○	○	○*(Ph2)	—	○	○
LCAch	20X	—	△	△	△	○	○	○	○	○*(PhC)	—	—	—
	40X	—	—	—	—	○	○	○	○	○*(Ph2)	—	—	—

○ : Possible combination

△ : Usable, but image may be dark depending on the NA.

○*: A phase contrast objective (Ph) is required for phase contrast observation.

— : Not usable, or combination with no corresponding objective

★ **Differential interference contrast observation is not possible using plastic vessels (Petri dishes, flasks, etc.).**

9 Selecting a Cube

Select the cube which matches the fluorochrome in use.

◎ Use in accordance with the band width of the excitation Several excitation filter combinations with different band widths are available. Wide band sets (designated by W) are normally used. In the following cases, however, other sets will give a better result.

① Weak fluorescence brightness (only B, G excitations)	⟶	Use Superwide band (SW) With SWB, strong auto-fluorescence may reduce image contrast.
② Samples emitting strong auto-flourescence	⟶	Narrow band (N) Fluorescence brightness is somewhat reduced.

Cube Dichroic Mirror/Filter Combinations

Excitation	Cube	Dichroic mirror	Exciter filter	Barrier filter	Application
U	U-MWU	DM400	BP330-385	BA420	• Auto fluorescence observation • DAPI: DNA staining • Hoechest 33258, 33342
	U-MNU		BP360-370		
V	U-MNV	DM455	BP400-410	BA455	• Catecholamine observation • Serotonin • Tetracyline
BV	U-MWBV	DM455	BP400-440	BA475	• Quinacrine, quinacrine, mustard • Thioflavine S • Acriflavine
	U-MNBV		BP420-440		
B	U-MWB	DM500	BP450-480	BA515	• FITC • Acridine orange: DNA, RNA • Auramine
	U-MNB		BP470-490		
	U-MSWB		BP420-480		
IB	U-MWIB	DM505	BP460-490	BA515IF	
	U-MNIB		BP470-490		
G	U-MWG	DM570	BP510-550	BA590	• Rhodamine, TRITC • Propidium iodide: DNA
	U-MNG		BP530-550		
	U-MSWG		BP480-550		
IG	U-MWIG	DM565	BP520-550	BA580IF	
IY	U-MWIY	DM600	BP545-580	BA610IF	Texas red

Band Pass Barrier Filter Combinations

U	U-MNUA	DM400	BP360-370	BA420-460	For observing only the U excitation stain, when using U excitation stain together with FITC.
IB	U-MWIBA	DM505	BP460-490	BA515-550	For observing only FITC, when using FITC and TRITC or Texas red for double staining.
	U-MNIBA		BP470-490		

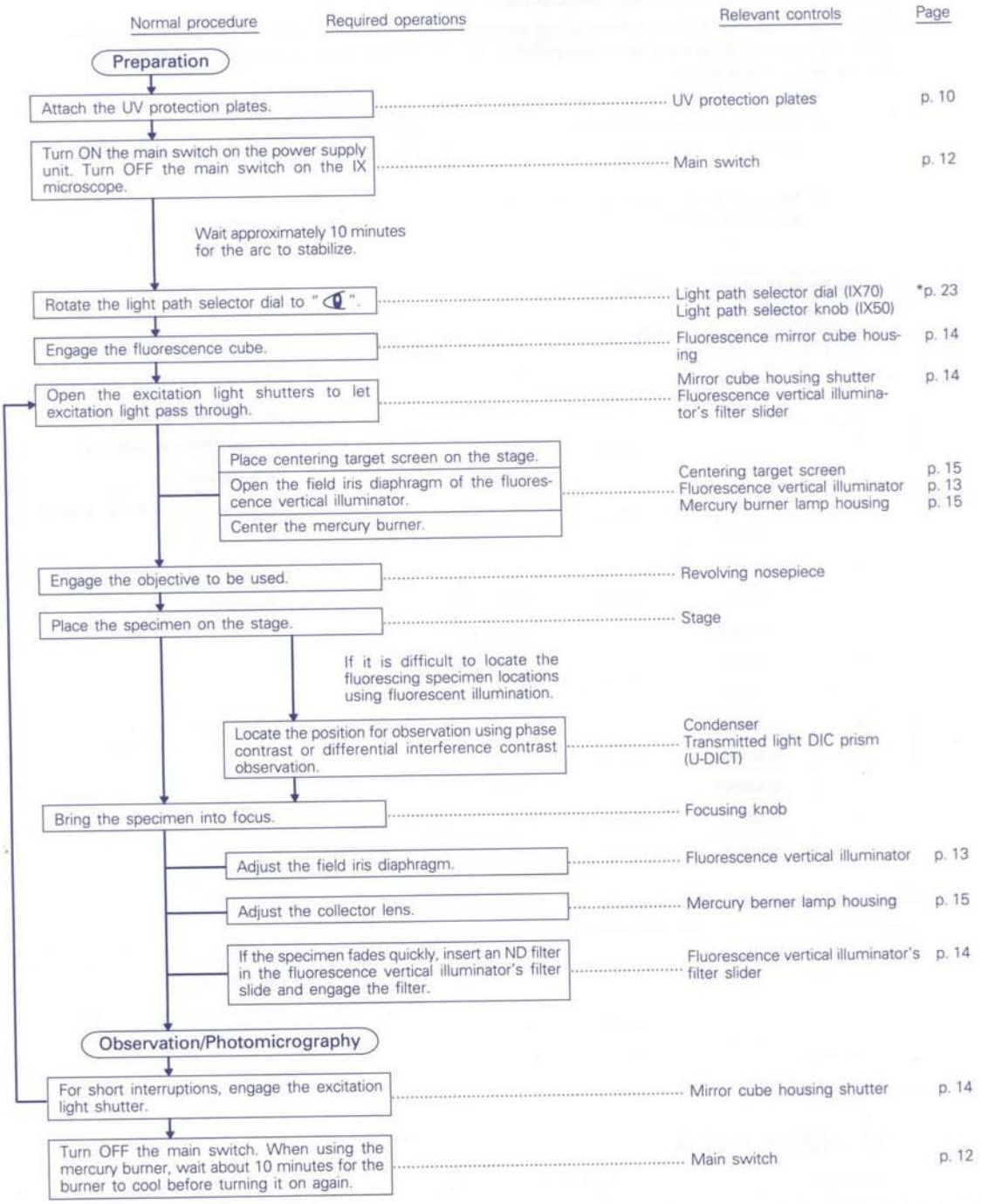
Cube Name Meaning

U-MNIBA

- U-M: Common to all cubes
- N: Wavelength SW: Superwide band W: Wide band N: Narrow band
- I: Excitation (U, V, BV, B, IB, G, IG, IY)
- B: Excitation (U, V, BV, B, IB, G, IG, IY)
- A: Cube for color separation

5 OBSERVATION

5-1 Summary of Observation Procedures


Normal procedure
Required operations
Relevant controls
Page
Preparation
Attach the UV protection plates.
UV protection plates
p. 10
Turn ON the main switch on the power supply unit. Turn OFF the main switch on the IX microscope.
Main switch
p. 12
Wait approximately 10 minutes for the arc to stabilize.
Rotate the light path selector dial to "".
Light path selector dial (IX70)
Light path selector knob (IX50)
*p. 23
Engage the fluorescence cube.
Fluorescence mirror cube housing
p. 14
Open the excitation light shutters to let excitation light pass through.
Mirror cube housing shutter
Fluorescence vertical illuminator's filter slider
p. 14
Place centering target screen on the stage.
Open the field iris diaphragm of the fluorescence vertical illuminator.
Center the mercury burner.
Centering target screen
Fluorescence vertical illuminator
Mercury burner lamp housing
p. 15
p. 13
p. 15
Engage the objective to be used.
Revolving nosepiece
Place the specimen on the stage.
Stage
If it is difficult to locate the fluorescing specimen locations using fluorescent illumination.
Locate the position for observation using phase contrast or differential interference contrast observation.
Condenser
Transmitted light DIC prism (U-DICT)
Bring the specimen into focus.
Focusing knob
Adjust the field iris diaphragm.
Fluorescence vertical illuminator
p. 13
Adjust the collector lens.
Mercury berner lamp housing
p. 15
If the specimen fades quickly, insert an ND filter in the fluorescence vertical illuminator's filter slide and engage the filter.
Fluorescence vertical illuminator's filter slider
p. 14
Observation/Photomicrography
For short interruptions, engage the excitation light shutter.
Mirror cube housing shutter
p. 14
Turn OFF the main switch. When using the mercury burner, wait about 10 minutes for the burner to cool before turning it on again.
Main switch
p. 12

*Indicates a page in the instruction manual for the IX microscope.

5-2 Simultaneous RL Fluorescence and TL Phase Contrast Observation

Perform the procedures for reflected light fluorescence observation and perform the procedures for transmitted light phase contrast observation on the IX50 or IX70 microscope.

It may sometimes be difficult to determine which part of a specimen is fluorescing by fluorescence observation only. In this event, using simultaneous phase contrast observation to observe the entire specimen, or taking photomicrographs, makes it is easy to located the fluorescing areas. Fluorescence observation and photomicrography can also be performed with the phase contrast objectives. In this case, the phase contrast illumination intensity may have to be balanced in accordance with the fluorescence illumination by engaging a green filter or by lowering the lamp voltage.

★ **The service life of a halogen bulb will be shortened if the bulb is continuously used at a low voltage. Accordingly, use a green filter, ND (neutral density) filter in a combination with the bulb to reduce the light intensity.**

◎ The IX70 is equipped with a light-off switch at the front of the microscope. Switching to fluorescence observation only can be accomplished simply by pressing the light-off switch to off.

5-3 Simultaneous RL Fluorescence and TL DIC Observation

Perform the procedures for reflected light fluorescence observation and perform the procedures for transmitted light differential interference contrast observation on the IX50 or IX70 microscope.

◎ To maintain the brightness during simultaneous reflected light fluorescence and transmitted light differential interference contrast observation, used the analyzer IX-AN.

★ **The polarizing plates used in the analyzer are vulnerable to heat. Accordingly, if the U-ANT is left engaged into the light path during reflected light fluorescence observation, the performance of the polarizing plates will deteriorate.**

◎ Adjust for optimum fluorescence and differential interference contrast image brightness.
◎ The IX70 is equipped with a light-off switch at the front of the microscope. Switching to fluorescence observation only can be accomplished simply by pressing the light-off switch to off.

6 TROUBLESHOOTING GUIDE

Under certain conditions, performance of this unit may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as appropriate. If you cannot solve the problem after checking the entire list, please contact your local Olympus representative for assistance.

Problem	Cause	Remedy	Page
1. Optical System			
1. Lamp lights, but field of view remains dark.	The shutter is closed.	Open the shutter on the fluorescence vertical illuminator and the mirror cube housing.	14
	ND filter is engaged.	Remove the ND filter from the light path as required.	14
	The cube is not correctly engaged.	Engage the cube correctly into the light path.	14
	The field iris diaphragm is not correctly opened.	The field iris diaphragm should be opened to the extent that the diaphragm image circumscribes the field of view.	13
	The cube is not suitable for the specimen.	Change to a suitable cube.	18
2. Image is unclear, blurred or has insufficient contrast.	Objectives and/or filters are dirty.	Clean.	—
	The field iris diaphragm is not correctly opened.	The field iris diaphragm should be opened to the extent that the diaphragm image circumscribes the field of view.	13
	The cube is not suitable for the specimen.	Change to a suitable cube.	18
3. Field of view is obscured, or field of view is not evenly illuminated	The objective is not correctly engaged.	Make sure that the revolving nosepiece clicks properly into place.	—
	The cube is not correctly engaged.	Engage the cube correctly into the light path.	14
	The field iris diaphragm is stopped down too far.	Open the field iris diaphragm sufficiently.	13
	The field iris diaphragm is not properly centered.	Center the field iris diaphragm correctly.	13
	The mirror cube housing's shutter is not completely opened.	Open the shutter completely.	14
	The filter slider is not at click-stop.	Insert the filter slider until it stops at the click-stop.	14
	Improper centering or focusing of the mercury burner.	Center or focus the mercury burner correctly.	15
2. Electrical System			
1. The main switch indicator does not light up.	Improper connection of the power cord.	Connect the power cord correctly.	—
2. Main switch indicator lights, but the mercury burner does not ignite.	Improperly connected connectors.	Connect correctly.	—
	The burner is not mounted.	Mount the burner.	8
	The lamp housing interlock mechanism is activated.	Tighten the burner socket clamping screw.	8
	Auto ignition is malfunctioning.	Turn off the main switch on the power supply. Turn on again. (Repeat as necessary.)	12
	Mercury vapor is not liquefied just after the light is turned off.	Turn off the main switch on the power supply, wait for 10 or more minutes, and then turn on the switch again.	12
3. The burner flickers or is dark.	Insufficient time has elapsed since the burner was turned on.	Wait for at least 10 minutes after turning on the burner.	12
	The burner life has expired.	Replace the mercury burner when the hour counter reading exceeds 200 hours. (Burner service life is 200 hours.)	10

★ If normal operation is not restored by performing the above remedial actions, contact your Olympus representative.

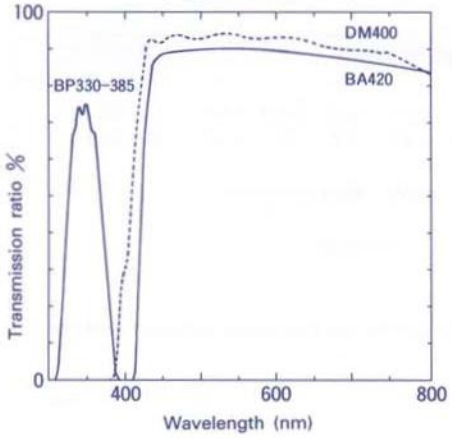
7 SPECIFICATIONS

Item		Specifications
Electrical rating	Input rating	200V region: 220 – 240V 1.8A 50 – 60 Hz 100V region: 100 – 120V 2.8A 50 – 60 Hz
	Output	20V 100W Mercury burner
	Replacement burner	US10 USH-102D
Ventilation	Naturally air-cooling system ★ **Make sure to leave at least 5 cm for the free space between walls or other objects.**	
Operating temperature	0 – 40°C	
Operating humidity	30 – 90%	
Polution degree	2 (In accordance with IEC664)	
Installation category (Overvoltage category)	II (In accordance with IEC664)	

8 OPTICAL CHARACTERISTICS

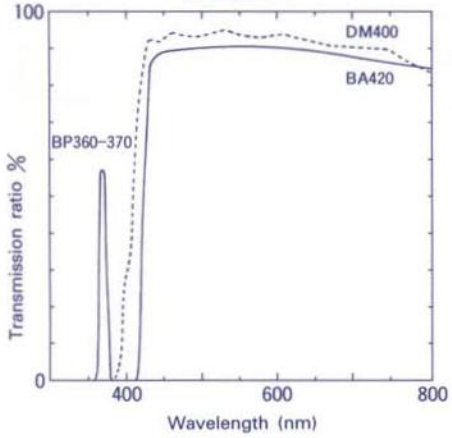
1. U excitation cube (Wide band)

U−MWU



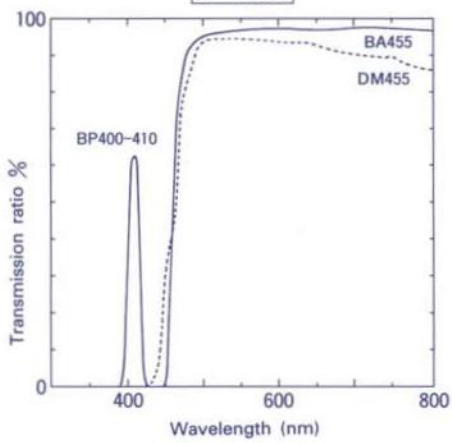
2. U excitation cube (Narrow band)

U−MNU



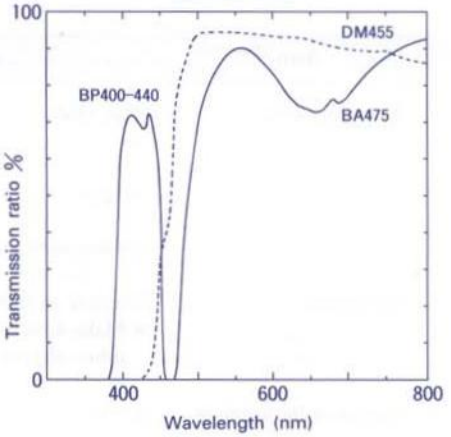
3. V excitation cube (Narrow band)

U−MNV



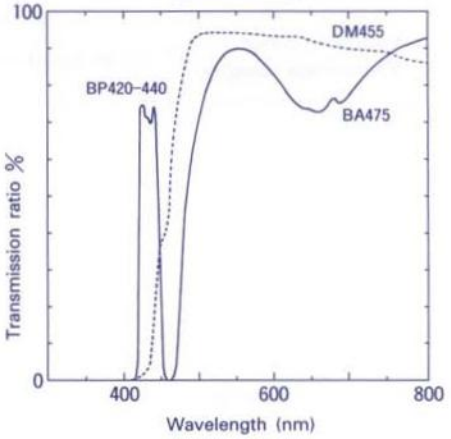
4. BV excitation cube (Wide band)

U−MWBV



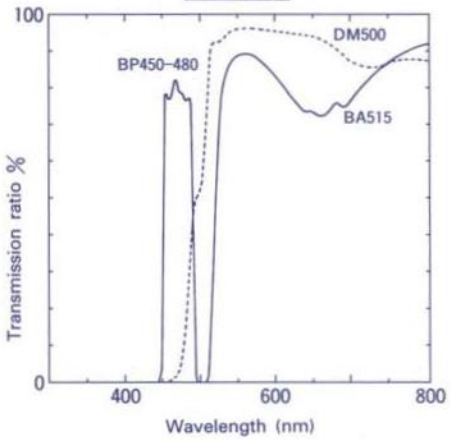
5. BV excitation cube (Narrow band)

U−MNBV



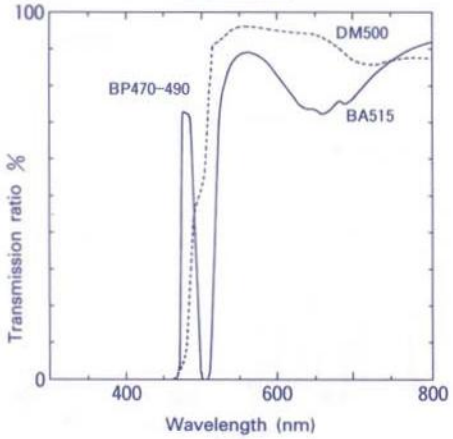
6. B excitation cube (Wide band)

U−MWB



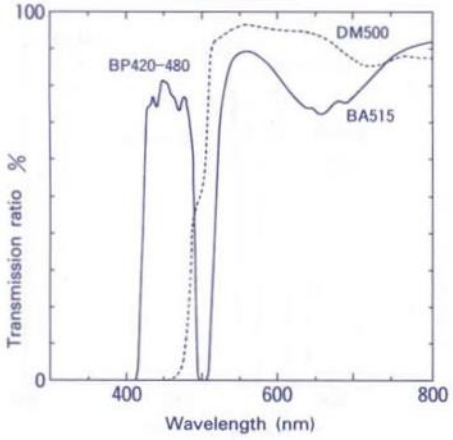
7. B excitation cube (Narrow band)

U-MNB



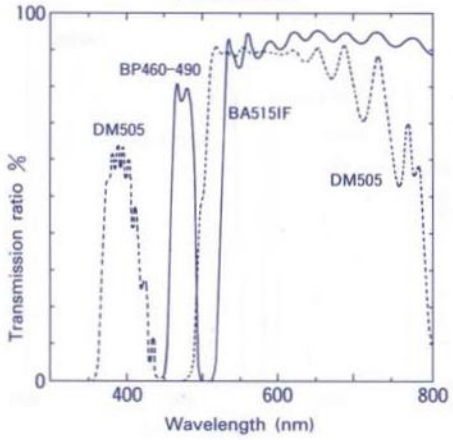
8. B excitation cube (Super wide band)

U-MSWB



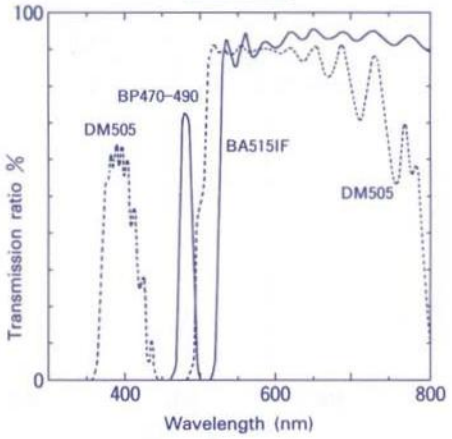
9. IB excitation cube (Wide band)

U-MWIB



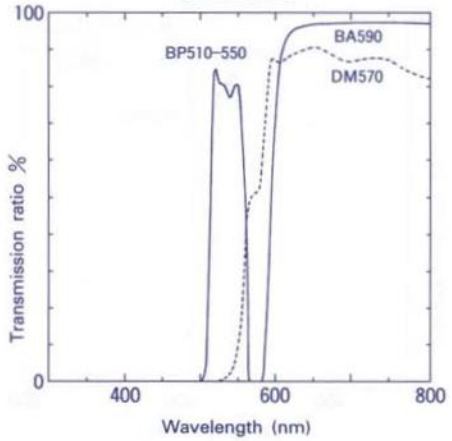
10. IB excitation cube (Narrow band)

U-MNIB



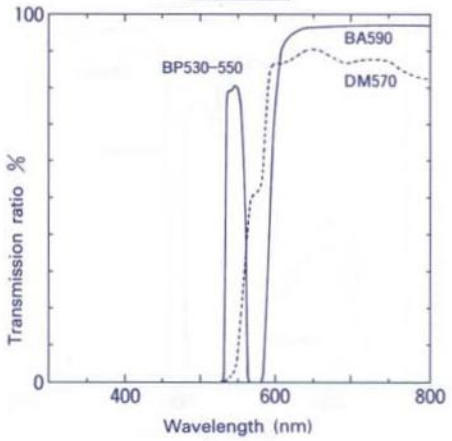
11. G excitation cube (Wide band)

U-MWG



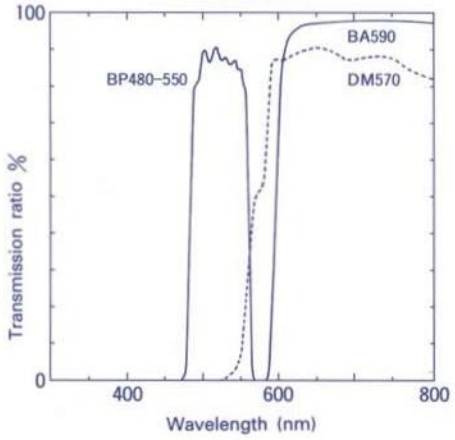
12. G excitation cube (Narrow band)

U-MNG



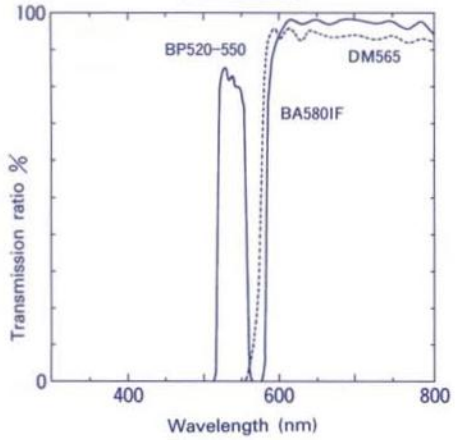
13. G excitation cube (Super wide band)

U−MSWG



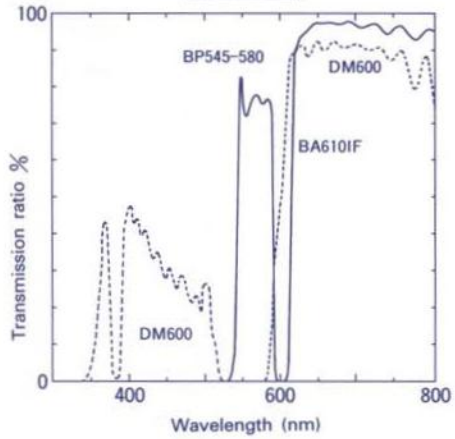
14. IG excitation cube (Wide band)

U−MWIG



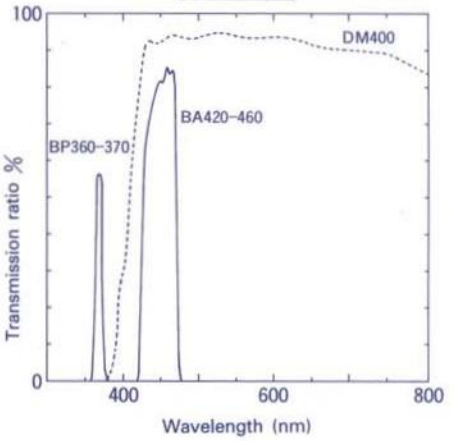
15. IY excitation cube (Wide band)

U−MWIY



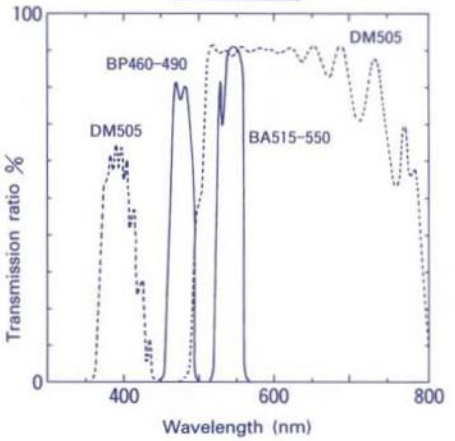
16. U excitation cube for color separation (Narrow band)

U−MNUA



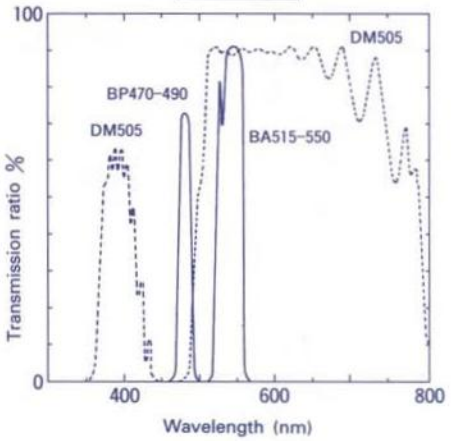
17. IB excitation cube for color separation (Wide band)

U−MWIBA

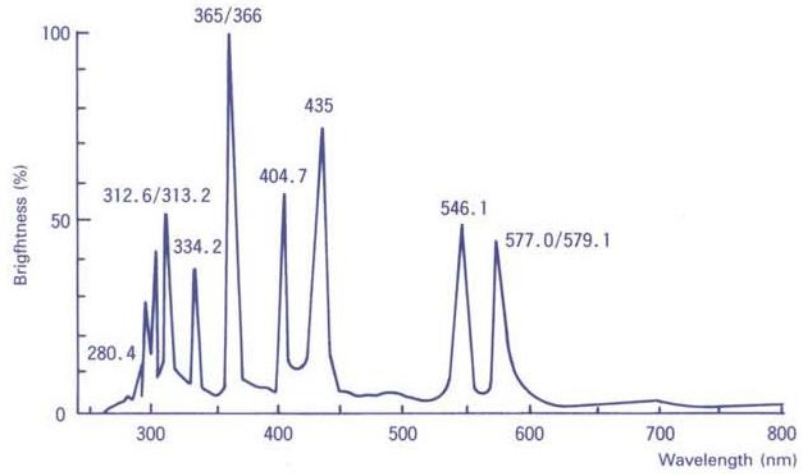


18. IB excitation cube for color separation (Narrow band)

U−MNIBA



Example for Spectral Radiance of
Extra-high Pressure Mercury Lamp



Specific wavelength is selected from many wavelengths and is used for the radiation of fluorescent color. The main lights used for this purpose are 5 kinds which have the wavelength of 365/366, 404.7, 435, 546.1 and 577.0/579.1 nm are also used, although they have low brightness.

MEMO

OLYMPUS

OLYMPUS OPTICAL CO., LTD.
43-2, Hatagaya 2-chome, Shibuya-ku, Tokyo, Japan

OLYMPUS OPTICAL CO., (EUROPA) GMBH.
(Premises/Goods delivery) Wendenstrasse 14-16, 20097 Hamburg, Germany.
(Letters) Postfach 10 49 08, 20034 Hamburg, Germany.

OLYMPUS AMERICA INC.
4 Nevada Drive, Lake Success, N.Y. 11042-1179, U.S.A.

OLYMPUS OPTICAL CO. (U.K.) LTD.
2-8 Honduras Street, London EC1YOTX, United Kingdom

The design of the product is under constant review and while every effort is made to keep this manual up to date, the right is reserved to change specifications and equipment at any time without prior notice.

This publication is printed on recycled paper.

Printed in Japan 9502 M 080 – ⓘ